

RADAR OBSERVATIONS OF ASTEROID 3908 Nyx (1980 PA)

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We report Doppler-only (cw) radar observations of near-Earth asteroid Nyx obtained at Arecibo and Goldstone in September and October of 1988. Weighted, optimally-filtered sums of cw echoes achieve signal-to-noise ratios of ~ 230 at 13 cm and ~ 70 at 3.5 cm. The spectra provide complete rotational phase coverage (period = 4.426 h, Drummond and Wisniewski 1990, Icarus 83, 349-359). Weighted sums of cw spectra yield an average OC radar cross section of 0.1 km^2 at each wavelength. Inversion of 13-cm echo edge frequencies yields a convex hull of the pole-on silhouette that has maximum pole-on dimensions of $0.9 \times 1.0 \text{ km}$. Nyx's convex hull is among the least elongated of all NEAs for which comparable shape information from radar observations is available. If we assume that the projected area of Nyx is the same as that of a sphere with a diameter of 0.9 km, then Nyx's 13 cm radar cross section and absolute magnitude of 17.4 correspond to upper limits on the radar and optical geometric albedos of 0.20 and 0.25. The circular polarization ratio of between 0.7 and 0.8 exceeds $\sim 90\%$ of those reported among all radar-detected near-Earth asteroids and implies an extremely rough near-surface at centimeter-to-decimeter spatial scales. Echo power spectra over narrow longitudinal intervals show a central dip indicative of a major topographic concavity or perhaps a structural bifurcation. Given sufficient echo strength, knowledge of an object's spin vector, and orientational coverage of the surface, all of which are available for Nyx, echo power spectra can be inverted to reconstruct an object's three-dimensional shape using the methods applied to 433 Eros by Mitchell et al. (1998, Icarus 131, 4-14). We are applying this method to the Nyx data with the hope of obtaining a unique shape model.